NAVTRAMETOC DET CORPUS CHRISTI INSTRUCTION 3140.2

Subj: LOCAL AREA FORECASTER'S HANDBOOK

Ref: (a) NAVMETOCCOMINST 3140.2E

Encl: (1) Local Area Forecaster's Handbook

1. Purpose. To publish, in the format established by reference (a), a meteorological and oceanographic handbook to assist local and sub-regional forecasters at Naval Air Station, Corpus Christi, TX.

2. Cancellation. NOCDCORPCINST 3140.2A

3. Discussion. The enclosed handbook provides forecasters with a description of the station, area terrain, weather phenomena unique to the Area of Responsibility (AOR), forecast guidance, and rules of thumb that will provide assistance in fulfilling the NAVTRAMETOC DET Corpus Christi mission.

4. Action

a. All personnel performing forecasting duties at this detachment will become thoroughly familiar with enclosure (1). Forecasters must remain vigilant and identify areas in the forecast process which require additional or improved techniques. All newly identified or developed forecast techniques/rules of thumb shall be forwarded via the chain of command for evaluation and possible inclusion in further revisions of this handbook.

b. Demonstrated knowledge of the contents of enclosure (1) is a prerequisite to local accreditation as Forecast Duty Officer (FDO) and Sub-regional Forecast Duty Officer (SRFDO).

c. Enclosure (1) shall be reviewed annually.

D. MILOT

Distribution:
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UNITED STATES NAVY

LOCAL AREA FORECASTER'S HANDBOOK

FOR

NAVAL AIR STATION, CORPUS CHRISTI, TX

AUGUST 1998

NAVAL TRAINING METEOROLOGY AND OCEANOGRAPHY DETACHMENT
651 BATAAN STREET, SUITE 116
CORPUS CHRISTI, TX 78419-5250

Enclosure (1)

RECORD OF CHANGES

Changes as received and entered will be recorded in the spaces provided below.

CHANGE NUMBER	DATE OF CHANGE	DATE ENTERED	SIGNATURE OF PERSON ENTERING CHANGE

FORWARD

This publication is a revision of the 1992 edition of the Local Area Forecaster's Handbook for Corpus Christi, Texas. The climatology for the Naval Air Station includes data through December 1995. This entire publication has been revised and should be read in its entirety.

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SECTION I

BASIC DESCRIPTION

A. STATION DESCRIPTION

Naval Air Station (NAS) Corpus Christi (Myron Truax Field), is one of five Naval Air Stations bordering the Gulf of Mexico from South Texas to Pensacola, FL and is headquarters for the Chief of Naval Air Training (CNATRA). Navy, Marine, Air Force, and Coast Guard student pilots selected for the Maritime community, or multi-engine propeller planes, report to NAS Corpus Christi for advanced flight training in the T-34C Mentor, the T-44A Pegasus, and the TC-12B Huron. NAS Corpus Christi falls under the operational control of the Chief of Naval Education and Training, Pensacola, FL.

B. FIELD LOCATION

The Naval Air Station is located on the northern tip of the Encinal Peninsula, which forms part of the southern boundary of Corpus Christi Bay :

· Latitude: 27 degrees, 42 minutes North
· Longitude: 97 degrees, 17 minutes West

Water surrounds the station on three sides. Shallow water, with depths ranging between 1 to 7 feet, lies to the east (Laguna Madre) and west (Oso Bay), while water depth of Corpus Christi Bay to the north ranges between 7 to 14 feet. The Gulf of Mexico is 7 miles to the east-southeast.

C. INSTRUMENT AND RUNWAY LOCATION

FIELD ORIENTATION: NAS Corpus Christi is designated an all-weather field with a runway elevation of 19 feet at the center. Its elevation ranges from 12 feet near the waters edge to 17 feet at the opposite end of the field.

Legend

A - 4” Rain Gauge
B - ASOS Unit #1
C - UMQ-5C
D - ASOS Unit #2

RUNWAY ORIENTATION (Figure I-3):

Runway Number	Length	Width
04-22	5000 FT	200 FT
13R-31L	8000 FT	200 FT
13L-31R	5000 FT	200 FT
17-35	5000 FT	200 FT

D. FIELD MINIMUM'S

The following field minimum's are for Category A aircraft at Naval Air Station, Corpus Christi, TX:

DEPARTURE

· Special Instrument Rating.

No Minimum required.

· Standard Instrument Rating.

PAR available: 200 - ½
PAR unavailable: 400 - 1

· Formation Instrument Departure:

RWY 31L: 500 - 1
RWY 13R: 500 - 1
RWY 17: 500 - 1
RWY 35: 500 - 1

APPROACH

· Precision Approach Radar:

RWY 31L: 100 - ½
RWY 13R: 100 - ¼
RWY 17: 100 - ½

RWY 35: 100 - ½

· Non-Precision straight in:

RWY 31L: 400 - 1
RWY 13R: 400 - ¾
RWY 17: 400 - 1
RWY 35: 400 - 1

E. OPERATIONAL AND ADMINISTRATIVE SPACES

NAVTRAMETOC DET Corpus Christi spaces are located on the main deck, Operations Hangar (Hangar 58), Rooms 119, 19A, 119B, 119C, 120, 120A, 120B and 121A. Base Operations and Flight Planning are adjacent to the Forecast Briefing Rooms. NTMOD Administrative spaces are located in Rooms 116 and 116A.

F. METEOROLOGICAL INSTRUMENTS AND EQUIPMENT

Automated Surface Observing System (ASOS)

The Automated Surface Observing System (ASOS) provides automated weather observation data for NAS Corpus Christi and the outlying Naval Auxiliary Landing Fields of Cabiness and Waldron. Each field has a Data Collection Package Unit (DCPU) located on the flight line and an Acquisition Control Unit (ACU) located either in the Operations spaces or the Control Tower.

The ASOS measures various weather parameters through the DCPU and sends the data to the ACU every minute, 24 hours a day. ASOS is designed to automatically collect, process and archive weather sensor measurement data. The ASOS sensors consist of the following:

- Cloud Height Indicator
- Visibility Sensor
- Precipitation Identification Sensor
- Freezing Rain Sensor
- Pressure Sensors
- Ambient Temperature/Dewpoint Temperature Sensor
- Anemometer (wind direction and speed)
- Rainfall Accumulation Sensor

The location of the ASOS sensor group DCP1 is 500 feet from the approach end of Runway 35. ASOS sensor group DCP2 is 100 feet from the approach end of Runway 13R. ASOS became the

primary sensor group for NAVTRAMETOC DET Corpus Christi in September 1993. All other equipment serves as backup to the ASOS.

METOC Integrated Data Display System (MIDDS)

MIDDS is the command's principle aviation weather support system. The system uses a multi-tasking client-server architecture and handles the ingestion, processing, display and dissemination of meteorology and oceanography (METOC) data at forecaster workstations and remote display monitors. MIDDS has four workstations: two of which support a bank of computer display monitors (the "Wall of Thunder"), while the remaining two serve as workstations for the Forecaster, Sub-Regional Forecaster and Observers. MIDDS software upgrades are issued periodically, which continue to improve the level of performance of the system. The principle MIDDS software packages are described below:

a. The Satellite, Alphanumeric and DIFAX (SAND) package automatically ingests and updates several streams of METOC data for use by the forecaster, including:

(1) High resolution visual (VIS) and infrared (IR) Geostationary Operational Environmental Satellite (GOES) imagery received from the National Environmental Satellite Data Information Services (NESDIS) via dedicated phone line. This portion of the SAND package replaced the old GSIDS system;

(2) Alphanumeric data from the DOD's Automated Weather Network (AWN) which automatically ingests some, but not all, of the data made available from the CMW;

(3) Digital Facsimile (DIFAX) broadcast, which is generated by National Center for Environmental Prediction (NCEP) and includes output from standard model (i.e. NGM, ETA, AVN) runs as well as selected forecast products. This package replaced the old PCGRAFAX software.

b. The Naval Oceanography Data Display System (NODDS) is a menu-driven software package which allows dial-in access to Fleet Numerical Meteorology and Oceanography Center (FLENUMETOCCEN) products. These products include Naval Operational Global Atmospheric Prediction System (NOGAPS), Wave Advection Model (WAM), and other Navy METOC models as well as NCEP and European Center for Medium Range Weather Forecasts (ECMWF) prediction data.

c. The Optimum Path Aircraft Routing System (OPARS) is used to request and receive optimum aircraft routing based on the NOGAPS model output.

d. NEXRAD data is available on the MIDDS with a fee charged for all data received. Due to the cost, NEXRAD data will only be accessed via MIDDS when the PUP is down and/or the data is needed for operational requirements.

Weather Vision (AN/GMQ-27)

The "Weather Vision" is a closed-circuit television system designed to provide current weather information for designated squadrons and departments located on NAS Corpus Christi. Each designated squadron or department has a monitor that displays the latest station weather observation and terminal aerodrome forecast (TAF), as well as local area weather observations and current conditions of readiness (COR) during the tropical cyclone season. The weather vision also supports an RCA video switch that adds looping capability and a video camera. SIGMET/WW/CAWW depiction's and current weather are placed in the looping mode when conditions warrant. Monitors are located in the Forecast Duty Officer area, squadron ready rooms, duty offices, Coast Guard operations, CCAD Operations, Base Operations, and the control tower. The Weather Vision will be replaced in early Fiscal Year (FY) 1999 with the establishment of a homepage following Base Wide Area Network (WAN) connectivity.

Lightning Positioning and Tracking System (LPATS)

The Lightning Positioning and Tracking System (LPATS) provides stand alone high resolution acquisition of lightning detection data for all the continental United States. Data is obtained from the National Lightning Network with the Network Control Center (NCC) in Tucson, AZ.

The LPATS is a PC-based system that uses a dedicated satellite antenna/receiver (located on the roof of Hangar 58), to acquire, analyze and display lightning stroke data associated with severe weather. The system dramatically enhances flight and crew safety through early detection of potentially severe weather associated with thunderstorm activity.

The software provides the user the ability to plot and track lightning data within a user-specified area. Current LPATS system configuration consists of a C-100 Earth Station Satellite receiver (dish antenna), an Equatorial Controller Unit, a Marta System 386/33 MHz CPU and a video graphics adapter (VGA) monitor.

WSR-88D Next Generation Weather Radar (NEXRAD)
Principal User Processor (PUP)

This system entails processing hardware, operating software, display monitor, graphics tablet and communications hardware that allows the forecaster to evaluate Doppler radar information received from the National Weather Service located at the Corpus Christi International Airport. The Principal User Processor (PUP) display monitor is located in the Forecast Duty Officer area. The NEXRAD is comprised of approximately 185 Doppler Radar sites and 400 PUP sites. Each NEXRAD Radar system operates independently, but has the capability to link weather information from any requested site, provided the communications facilities are in place.

Pilot to Metro Service (PMSV)

The Pilot to Metro Service (PMSV) is a two-way transmitter dedicated for communication between "Corpus Metro" and aircraft within radio range. This system is located under the forecast counter and uses the frequency of 344.6 MHz. The Forecast Duty Officer monitors this circuit 24-hours a day.

Precision Aneroid Barometer (ML-448/UM)

The Precision Aneroid Barometer pressure sensing instrument is the primary back-up to the ASOS pressure sensors. It is located in Room 120 at a height of 5 feet AGL.

Marine Microbarograph

A Belfort Marine Microbarograph is located in the observer's space and provides a graphical depiction of pressure rises and falls.

Wind Measuring System (WINDBIRD) (AN/UMQ-5C)

The AN/UMQ-5C Aerovane is located along the approach end of Runways 13 and 35 at a height of 13 feet AGL. It serves as a back-up to the Automated Surface Observing System (ASOS). An analog display of wind data is located in the Forecast Duty Officer area.

Hand-held Anemometer (PMQ-3)

The PMQ-3 is maintained in its case and stored in the operational spaces. It serves as a back-up to the ASOS and AN/UMQ-5C wind measuring instruments.

Geophysical Fleet Mission Program Library (GFMPL)

This is roughly the same software suite used by afloat Operations Aerology (OA) divisions and Mobile Environmental Teams (METs) to provide tactical forecast products; the unclassified version does not contain any classified databases used to generate classified sensor performance predictions. The applications which are used most often are the Solar Lunar Astronomical Program (SLAP) predictions programs.

Weather Information Line

An automated weather information line, extension (512) 961-3404, with the current and forecasted weather information, is updated at 0430 and 1630 each day. Tropical cyclone

information is provided during tropical cyclone season.

Hurricane Hotline

The National Hurricane Center's (NHC) Hurricane Hotline is a dedicated unclassified telephone network that connects NHC and other NCEP activities to a host of approved civilian and military agencies for the purpose of discussing tropical cyclone prediction guidance. These calls precede the issuance of tropical cyclone warnings and are conducted in conference-call fashion. As many as thirty agencies may be participating in or listening to these discussions.

Unclassified Telephone Facsimile Units

Two SHARP (FO-215) and (FO-5220), telefacsimile units are located in the forecast area to facilitate the transmission and receipt of flight weather briefings for pilots stationed at the Naval Air Station that are outside the local area. One system, 1-800-531-9963, is funded by CNATRA for Commander, Training Wing Four, pilots. A second system, DSN 861-3774 or COML (512) 961-3774, is used for administrative and operational support.

Gateguard

The Gateguard is a personal computer (PC) based AUTODIN message traffic system used to receive, store and transfer standard Navy text messages. The system configuration allows the transfer of unclassified and classified information to the SECRET level without compromise. The AUTODIN message system will be upgraded and replaced by the Defense Message System (DMS) in Fiscal Year (FY) 1999.

G. COMMANDS AND STAFFS SUPPORTED

The Detachment offers a full range of meteorological and oceanographic (METOC) products and services to a wide variety of Navy, DoD, and civilian commands located on board or near NAS Corpus Christi. Discussions of NAVTRAMETOC DET-specific products and forecasts are provided in the Environmental Services Support Manual (NAVTRAMETOCDETCORPCINST 3140.1 (series)).

There are two primary training squadrons of T-34C aircraft and one advanced training squadron of T-44A and TC-12B aircraft stationed at this airfield.

The Chief of Naval Air Training (CNATRA), headquartered on board the air station, has under its operational control:

- Commander, Training Air Wing Four (CTW-4)

CTW-4 has under its operational control:

- Training Squadrons (VT-27), (VT-28) and (VT-31)

Other commands supported include:

- Commander, Mine Warfare Command (COMINEWARCOM)
- Helicopter, Mine Counter-measures Squadron (HM-15)
- Corpus Christi Army Depot (CCAD)
- Coast Guard Air Station
- Naval Station (NAVSTA), Ingleside
- Ships present at NAVSTA Ingleside
- U.S. Customs Service
- Mine Warfare Training Center (MIWTRACEN)

NAVTRAMETOC Detachment Corpus Christi is also a Sub-Regional Forecast Center (SRFC), providing forecast and warning support for NAS Kingsville and NAS-Joint Reserve Base (JRB) Fort Worth during evening, weekend and holiday hours.

The Officer in Charge of NAVTRAMETOC Detachment Corpus Christi reports additional duty (ADDU) as the Meteorological Officer to Chief of Naval Air Training.

SECTION II

CLIMATOLOGY

A. FRONTS

The majority of change to weather that South Texas experiences is in the form of fronts transiting through the region. Therefore, an understanding of the characteristics of frontal weather versus air mass weather is of vital importance.

From mid October through early May, the local weather alternates under the influence of modified Polar, Arctic and Tropical air masses. Cold fronts generally approach from the north and northwest and are dependent on the flow aloft, the position of the associated low and the relative motion of the associated cold front.

Customarily, fall and early winter frontal systems move in from the north as the low pressure center follows a path across the Great Plains from west to east. In late winter and spring, fronts move through the area from the northwest. This occurs as low pressure centers move across the Rockies or form in the lee side trough near the Texas panhandle.

An average of about one polar front every five to eight days enters South Texas from November through April. Warm fronts are most active during the winter season with some activity during the spring or fall. Warm fronts originating in the Gulf of Mexico produce some of the poorest flying weather conditions experienced in this region. The frequency of frontal activity begins to decrease during May, and increases again during September.

B. WINTER AIR MASSES (OCTOBER THROUGH APRIL)

Artic (A)

During January and February, infrequent penetrations of Arctic air make a significant change to the weather in South Texas. Although this type of air mass becomes considerably modified as it reaches the Gulf Coast, it can be accompanied by freezing temperatures. The presence of relatively warmer water surrounding the local area generally modifies the air at the lower levels and keeps surface temperatures above freezing. During brief periods of five to seven days each winter, freezing temperatures have been recorded. Arctic air masses are shallow when they reach the Gulf Coast producing some of the worst flying weather in the form of low ceilings and freezing rain. Snow has occurred at times, but the instances of solid precipitation are rare.

Continental Polar (cP)

Continental Polar is the most predominant winter air mass. As this air mass moves away from its source region over the rough terrain to the northwest of this area, moderate turbulence may be present in low stratocumulus clouds, as well as accompanied by occasional snow flurries.

When cPk air, following a cold front, reaches the warm waters of the Gulf, its temperature is usually about 10 degrees lower than the water temperature. Air flowing over the water surface is warmed from below and the lower layers will eventually become unstable. In addition, water vapor is quickly added to the air by evaporation from the relatively warm water surface. Usually an outbreak of continental polar air is accompanied by wind speeds of 15 knots or greater. This amount of wind speed helps to decrease the stable conditions in the lower levels.

Clearing accompanies most cold front passages in South Texas. The degree of local clearing is dependent on how far southward the cold air extends into the Gulf of Mexico. A strong cold air outbreak will result in one to three days of clearing, cold surface temperatures and gusty west through northwest winds. When the return of an onshore flow from the Gulf of Mexico occurs, low ceilings and low visibilities will occur due to the combination of modified cP and mT air mixing together.

Maritime Polar (mP)

Maritime Polar air appears during the transitional seasons of spring and late fall. The trajectory of this air mass moves it from the Pacific Northwest to the southeastern portions of the United States. In its source region, maritime polar air is characterized by surface temperatures above the freezing point, moderately steep lapse rates, and near saturation up to high levels.

The weather associated with this air mass is characterized by cumulus and cumulonimbus clouds with frequent showers. Visibility is generally good, except in areas of precipitation. Convective activity increases as the air mass is lifted over the Rocky Mountains. This lifting results in heavy rain and snow showers with considerable turbulence and icing on the windward side of the mountains. This process dries out the air mass which usually results in clear skies, warm days and cool nights as it approaches the local area from the northwest. But, the air mass is subject to rapid modification due to the influence of the Gulf of Mexico as it approaches the local area.

Maritime Tropical (mT)

This air mass enters the local area from the south and southeast in association with the circulation around the Bermuda High pressure system. Maritime Tropical air will prevail from mid spring to late fall and can frequently extend over the South Texas Coastal Bend area periodically during the rest of the year. Maritime Tropical air that is formed over the Gulf of Mexico is usually conditionally unstable. This instability may be released by frontal or orographic lifting. Overrunning of Polar air over mT air in the winter occurs commonly in this area and usually results in low stratus clouds (low ceilings) and generally restricted visibilities.

Superior (S)

Superior air is a high level air mass found over the Southwestern United States which sometimes reaches the surface. Due to the effects of subsidence, it is the warmest air mass on record in both winter and summer. It is extremely dry and provides cloud free skies and excellent visibility.

C. SUMMER AIR MASSES (MAY THROUGH SEPTEMBER)

Continental Polar (cP)

The source region for this air mass in summer is confined roughly to the northern two thirds of Canada. Occasionally, however, this air mass will move out of its Canadian origin and invade the mid to southern portion of the United States. When this happens, the air mass will preserve its temperature characteristics and convective activity will be mild and extensive. Convective activity associated with this air mass will generally be confined in height to the 700mb (10,000ft or less) level.

Continental Tropical (cT)

This air mass is found only during the summer and forms over a small area of northern Mexico, western Texas, New Mexico and eastern Arizona. Its extremely high surface temperatures, very low humidity, large diurnal temperature ranges, and rare precipitation can identify it. Flying conditions are excellent with respect to weather, but clear air turbulence is extensive. Occasionally, cT air will replace mT air in this area, however, this is very infrequent. When this happens, extreme temperatures, particularly at inland stations, can be greater than 100 degrees F.

Maritime Polar (mP)

Throughout most of the summer time frame, the west coast of the United States is usually under the influence of mP air. It is much milder in summer and seldom extends east of the Rockies. The influence on Texas coastal weather is of little consequence. During these periods, coastal fog and stratus occur during early morning hours with scattered cumulus forming by early afternoon.

Maritime Tropical (mT)

This air mass has the most extensive influence on the East and Gulf Coasts during the summer months. The mT air is quite warm and moist with dewpoints near or in excess of 70 degrees F at the surface. Low stratiform clouds are the rule during the morning hours, especially along the northeastern coastal regions. Convective type clouds are produced during the afternoon with frequent thunderstorms influencing most of the coastal regions by late afternoon. Flying conditions are not hazardous because the thunderstorms can generally be circumnavigated.

Ground fog can be frequent with the northward movement of the mT air over land, and sea fog can be frequent with the movement of this air mass over water.

D. LOCAL CLIMATOLOGY

Although the terrain of the area exerts very little influence, it does not impede the passage of transient systems from the west and northwest. The Corpus Christi Bay and Gulf of Mexico play an important part in moderating the local weather by producing a pronounced sea breeze effect in the summer and tempering the effects of polar outbreaks in the winter. However, the effects of extensive Arctic outbreaks can be experienced when the depth of the cold air mass is sufficient to move the polar front well south of the station.

There is no established delineation of the four seasons. The local climate is characteristic of sub-tropical weather with short mild winters and warm humid summers.

Tropical cyclones are a threat to the area during the period of 1 June through 30 November. Several destructive tropical cyclones have been experienced throughout the Coastal Bend area in the past few decades. An average of two to four hurricanes annually develop in the Gulf of Mexico. Storms entering the Gulf from the Caribbean are considered the most dangerous as they are usually mature and extensive. Storms that develop in the Gulf do not grow to maturity before crossing a coast line but are a real threat to the coastal regions as they are fast-moving and present a reduced amount of time to prepare for emergencies and contingencies. Tracks of these storms are frequently erratic.

The mean summer temperature during the months of June, July and August is approximately 85 degrees F. The mean maximum temperature for these months is 90 degrees F and the mean minimum temperature is 79 degrees F.

The mean winter temperature during the months of December, January and February is 60 degrees F. The mean maximum temperature for these months is 66 degrees F and the mean minimum temperature is 52 degrees F. The coldest temperatures normally approach freezing or below only five to seven days per year during the second week of January.

The mean number of days per month with precipitation ranges from four days in July to ten days in September. However, days with measurable amounts can occur during several days of the year. Average annual precipitation is 30.3 inches. The largest measurable amounts occur in summer during the daylight hours and are directly attributed to thunderstorm activity. Precipitation during the nighttime hours (1900-0700 CST) normally has the lowest frequency of occurrence. Precipitation during the winter can occur for prolonged periods but is not as intense as summer. Solid precipitation, such as snow, snow pellets or sleet rarely occur in this area. The driest months are January and February.

E. SEASONAL WEATHER PATTERNS

1. WINTER (DECEMBER - FEBRUARY)

During the winter months, the area alternates under Polar (P), modified Tropical (T) and occasionally Arctic (A) air. Low clouds, fog, drizzle and mild temperatures characterize the weather.

In December through February, polar air masses dominate our local weather patterns, which become subjected to rapid modification as they approach the Gulf of Mexico. When they move over the Gulf, the return flow of cP and mT air generally produces low stratus clouds. During winter, cP air moves into the local area following a cold front from the north or northwest and usually produces one to three days of clear, cold weather with gusty surface winds. These periods of clear weather are dependent upon the depth of the air mass and extent that they move southeastward into the Gulf of Mexico.

Arctic fronts passing through the area will normally cause mT air to overrun the front and produce low stratus, fog and drizzle. Winters differ sharply from year to year. A very severe winter may be followed the next year by a very mild one. A severe November may be followed by a mild December.

Extreme minimum temperatures near 20 degrees F may be recorded during some years, while during others, the low temperature may be 35 degrees F or higher. Maximum temperatures can vary to an even greater degree. The extreme maximum during January, for example, is 85 degrees F.

The flow pattern in the upper levels is responsible for these extreme departures from normal. The strength and direction of the zonal westerlies not only determine the extent of the southward penetration of cold air masses, but they also induce the downslope winds over the western mountains which produce the extreme high winter temperatures.

Some reliable characteristics of winter weather are:

- The depth of the moist surface layer averages 6,000 ft and very seldom exceeds 10,000 ft.
- Post-frontal air masses are usually dry and rarely extend above 10,000 ft.
- Precipitation averages less than two inches per month and consists of light rain and drizzle along frontal zones.
- Strong northerly winds (20 to 30 knots) accompany over 80% of all fronts between November and March and persist for an average of two days.
- Squall lines and active cold fronts are rare, with respect to thunderstorm activity, after November.

The forecaster should note that slightly beyond the local forecast area to the north and east, the moisture layer increases in depth and fronts are usually more active. At Matagorda, 75 miles to the northeast, and Houston, 120 miles to the northeast, the average annual rainfall is nearly twice that of NAS Corpus Christi.

2. SPRING (MARCH - MAY)

The spring transitional period of March through May is marked by brief frontal passages over the South Texas Coastal Bend area from the mountainous regions to the northwest. Lows that move across the central and southern Rockies induce the strongest southerly wind gradients ahead of the fronts. Consequently, wind speed averages are high and alternate between north and south in direction. Beginning in April, sufficient moisture is available to produce squall lines and rather active cold fronts. Showers and thunderstorms occur frequently after mid April and reach a maximum in May. As the moist Gulf air increases in depth, a higher frequency of instability results. Although the frequency of fog and stratus decreases during this period, Gulf waters are still cool enough to result in fog or stratus whenever mT wind flow is from the east or southeast.

3. SUMMER (JUNE - AUGUST)

The Bermuda High, a semi-permanent high pressure system, is the main influence on area weather beginning in June. The local area is under the influence of mT air which extends westward across the Gulf of Mexico to about 10 to 15 miles inland. Statistics indicate nearly ideal flying weather 96% of the time. Weather of any consequence occurs from transitory easterly waves from the tropics and/or occasional passages of tropical cyclones.

The anticyclonic flow aloft over the area discourages frequent patterns of convergence. Most easterly waves will weaken as they approach the coast due to the dominance of this type of wind flow. Instability prevails for several mornings following passage of a tropical wave with decreasing shower activity occurring each day. Weather consists of broken to overcast middle and high clouds with morning showers and scattered thunderstorms. These thunderstorms will often reform inland during early afternoon hours producing brief surface wind gusts of up to 30 knots in showers.

4. FALL (SEPTEMBER - NOVEMBER)

The transitional months of September through November offer some variety in the weather patterns as modified polar air masses move through the area. Daytime temperatures are mid and most nights are cool.

Outside of occasional weather induced by frontal activity, these are the most pleasant months of the year. Commencing in early October, the weather alternates under mT and modified cP air.

Some weather is produced as the first fronts meet deep, moist Gulf air. It is during this period, when squall lines developing in advance of cold fronts induce potentially severe weather. Generally, the heaviest concentrations of thunderstorms pass north of Corpus Christi, but on occasion a developing squall line will pass over the area and produce heavy showers and winds gusting up to 50 knots.

SECTION III

FORECASTING

A. TEMPERATURE

In the local area, temperatures during the nighttime hours throughout the year range within three to five degrees of the surrounding sea surface temperatures. Exceptions are the drop in temperature observed after a strong frontal passage.

The influences of sea surface temperature on local temperatures cause minimum temperatures to be four to six degrees (occasionally eight to ten degrees) above those found a few miles inland. For this reason, temperatures recorded below 32 degrees F are rare. In winter and spring, when the water temperature is colder than the air temperature, maximum afternoon temperatures along the coast can be three to six degrees below the temperatures that are recorded inland.

The following temperature rules of thumb apply:

- Whenever the water temperature is 65 degrees F or higher and wind flow during the nighttime hours is from the east to southeast, the minimum temperature will be within two to three degrees of the water temperature.

- Following strong cold frontal passage, the lowest minimum temperature will generally occur on the second night after the frontal passage. Low temperatures can generally be forecast with good accuracy by going upstream from the station, about 24 hours, using the 1000-foot level winds and adding ten degrees to the minimum reported temperature at that point. Some representative stations located in or near Texas for this method are Oklahoma City, Lubbock, Abilene, Big Springs, Fort Worth, and Waco.

- Below freezing temperatures are infrequent. Whenever the temperatures inland are forecast to be above 26 degrees F, expect temperatures at the station to remain above freezing.

- Extreme low temperatures are produced whenever a very cold air mass plunges into the Gulf of Mexico with rapid post-frontal clearing.

- Southeasterly wind flow at 10 to 15 knots or higher and/or total sky cover will prevent below freezing temperatures on the first night following cold frontal passage. However, on the second night, if skies are clear and surface winds are light from the north or northwest, expect temperatures to be below 32 degrees F.

B. GRADIENT WIND

Significant rises in pressure accompany strong frontal systems moving into the Texas Coastal Bend area. Station pressure readings from San Antonio and northward will indicate whether or not higher wind velocities will be experienced at NAS Corpus Christi. In the situation where a strong cold front is approaching the area, the forecaster can expect frequent wind gusts in excess of 30 knots. Wind velocities can be forecast with great accuracy by observing wind reports as the front passes San Antonio and Victoria. Water temperatures play an important factor also. If sea surface temperatures are observed to be below 60 degrees F, expect wind speeds to remain at the mean climatological wind speed for the San Antonio area. When water temperatures are above 60 degrees F, add 5 knots to the San Antonio and Victoria average maximum wind.

The following forecast wind speed rules of thumb apply:

- Sustained wind speeds of 20 knots or higher and frequent gusts to 30 knots or more may be forecast from the south and southeast whenever the pressure gradient between Laredo and New Orleans exceeds 7 millibars. The wind speed drops to less than 20 knots after 2200 local.

- When the pressure gradient between Laredo and New Orleans is 5 to 7 millibars, forecast surface wind gusts to range between 20 and 30 knots.

- Gradient level winds observed from the morning sounding is a reliable indication of the peak wind gust to forecast during the late morning and afternoon hours. Whenever the first significant level wind is 30 knots or more, forecast marginal afternoon and evening surface gusts to 30 knots or more.

- If the wind gradient is from the southeast, the sea breeze effect is added and wind speeds become super gradient.

- Winds associated with easterly waves usually shift gradually from the northeast and southeast and then southerly behind the wave. Strong wind gusts follow the passage of each easterly wave axis; however, wind speeds rarely exceed 35 knots.

C. FOG/CLOUD FORMATION

Sea surface temperatures in the Gulf of Mexico play an important role in the formation of fog in the local area. During late winter and early spring, sea surface temperatures reach a mean low of 50 to 55 degrees F. If the air temperature rises above the sea surface temperature, stratus frequently forms along the coastal area and moves onshore over NAS Corpus Christi. Advection fog normally occurs from mid-December through April.

A marked decrease in the amount and frequency of fog and stratus is usually observed during a mild winter. If there is little occurrence of freezing temperatures, the lowering of the sea surface temperature alone is not sufficient enough to produced any extensive fog.

The formation of stratus (with ceilings usually below 1000 feet) for the most part, occurs between 2100 and 0400 local. The lowest ceiling occurs seaward to the south and southeast of the station. During sunrise, stratus often becomes fog. This may also occur if surface winds are in excess of 10 knots or more. The fog usually lifts and becomes stratus by 0900 local with scattered conditions prevailing by 1100 local.

If broken ceilings persist beyond 1200 local, stratus clouds in the lower levels will continue to last for most of the day. This condition can be determined from the CRP International upper-air sounding in addition to the location of upper level troughs to the northwest of the station. In early April, when surface air temperatures of 65 to 69 degrees F are observed, fog and stratus make irregular appearances. Fog and stratus occurs following passage of weak to moderate cold fronts; sea surface temperatures may fall rapidly and induce several days of fog and stratus (decreases of six to eight degrees in two days have been recorded).

Advection fog is rare when sea surface temperatures reach 70 degrees F or above.

The tidal range in the local area does not produce a large sea height increase; however, the overall water surface area is greatly increased. There is considerable evidence that tide and wind direction greatly influences fog formation during winter and spring. The following fog and cloud formation thumb rules apply:

FOG

- When the tide is at flood stage, water temperatures are 62 degrees F or lower, and the wind direction ranges from the northeast to southeast, forecast advection fog. However, if wind speeds are in excess of 14 knots, fog is most likely to occur when dewpoints are above 56 degrees F.

- Conditions favorable for stratus formation are also favorable for fog development.

- When dewpoints at 1200 local during the winter months along the coast are 70 degrees F or higher and onshore wind flow has persisted for 24 to 48 hours, advection fog will move onshore near sunset with visibilities reducing to near zero by 2000 local.

- In winter and spring, fog prevails in active warm fronts which have developed and progressed along a line from Austin, Beeville, McAllen, and Brownsville. A quasi-stationary front will produce the same conditions and may persist for much longer periods.

STRATUS

- During the months of February through April, when sea surface temperatures are less than 68 degrees F and the dewpoint is forecast to be above 65 degrees F, low stratus (600 to 1200 feet) should be expected whenever the surface wind direction is from the east through south.

- Pressure falls observed in northeast Texas lessen the chance of stratus.

- During the winter months, the first night return wind flow from the Gulf of Mexico in

association with either maritime or continental polar air masses generally produce lower and thicker stratus layers than in spring. These stratus layers tend to dissipate much later in the day.

- In spring, formation of stratus seldom occurs until the second or third night of return wind flow. Dissipation and lifting normally occur by mid morning.

- In spring, when the air temperature has risen to the high 80's and surface winds are gusting above 25 knots from the southeast, stratus often forms 9 miles southeast of NAS on Padre Island. This stratus usually moves over the station after 1500 local and cause ceilings to decrease to less than 500 feet and reduce visibilities to less than 3 miles.

- When migratory high pressure centers cross the Mississippi River during late winter and early spring, forecast stratus to form the following night.

- In summer, significant surface pressure rises following passage of an easterly wave over South Texas normally produces an increase in nocturnal stratus.

- In forecasting the dissipation of stratus, it is necessary to determine thickness of the layer, presence or absence of higher clouds, and degree of coverage.

- High tide, precipitation, first return of tropical air, and the presence of a warm front enhance conditions for stratus formation.

CUMULUS

- During the summer months, with sea surface temperatures in the high 70's to low 80's, cumulus type clouds are the predominate type of cloud. Formation occurs over water after 0300 local, moving inland with broken to overcast bases of 1000 to 2000 feet between 0700 and 1000 local.

- Cumulus clouds that build 12,000 to 25,000 feet during early morning hours are brought inland by the sea breeze.

- With light winds aloft and a stability index of +1 or less, scattered showers occur along the coast and dissipate rapidly after passing inland.

- During the afternoon, skies become scattered to broken inland with bases 2000 to 3000 feet; clearing occurs along the coast.

CIRRUS

- With southwesterly flow at and above the 500 millibar level, expect cirrus to form, depending on the moisture flow from the eastern Pacific Ocean. Satellite pictures are highly useful in forecasting the trajectory of moisture that contributes to cirrus formation.

- cirrus.

D. PRECIPITATION

DRIZZLE

- Drizzle of any appreciable amount and intensity should be forecast when strong southerly winds aloft (2000 to 10,000 feet) are prevalent in association with overcast stratus.

- Horizontal wind convergence enhances the possibility of drizzle. The first return of tropical air, mixing with polar air and the warm front aloft, adds to the probability of drizzle.

FREEZING RAIN

- Freezing rain at the surface occurs very rarely, even when surface temperatures reach as low as 30 degrees F. This phenomena is induced by cold precipitation that usually falls from a warm overrunning stratum of air down through a very shallow cold wedge of air lying below it. If the cold air wedge is over 3000 feet thick, freezing rain forms and light snow may be observed.

THUNDERSTORMS

- Severe thunderstorms are infrequent directly over the Naval Air Station. Hail rarely occurs, but when it does, it is generally small in size.

- Nocturnal thunderstorm activity is prevalent in the late summer during the early morning hours. They usually persist until approximately 0900 local. Normally, these thunderstorms do not progress inland more than 10 to 15 miles.

E. FRONTS

- Frontal systems in association with northwesterly wind flow aloft result in no extensive cloud pattern, little or no precipitation, and rapidly clearing behind the front.

- In fall and winter, when the sea surface temperatures are over 60 degrees F, the Gulf of Mexico has a retarding effect on cold fronts. When a cold front enters the Gulf, it tends to assume the contour of the coastline, and in cases where the cold air is shallow, becomes stationary about 100 miles off the coast.

- In winter and spring, when any significant frontal discontinuity lies in South Texas, and a 500 millibar trough reaches the California/Arizona border, forecast a wave to form in South Texas within 12 hours. If the front lies in the Gulf of Mexico, forecast the wave to form in the vicinity of the intersection of the front with the Texas or Mexican coast.

- In winter and spring, a quasi-stationary Arctic front anywhere from North Texas to Nebraska,

with large height rises at the 500 millibar level in the vicinity of Montana northward into Canada are indicative of the beginning of rapid southward movement of the front. The front will continue its rapid movement well into the Gulf of Mexico. Rapid clearing should be forecast following frontal passage.

- If the 200 millibar temperature at Salt Lake City is -60 degrees C or colder, fronts passing through South Texas will continue southeastward without wave formation. If the 200 millibar temperature is warmer than -60 degrees C, fronts pushing into South Texas will have a tendency to slow down and form waves.

- When an active wave is off the Texas coast and large pressure falls develop in southern Louisiana with gusty easterly surface winds at Galveston and Beaumont, forecast rapid northeast movement of the wave with possible thunderstorms in southeast Texas.

- Winter warm fronts average 8 to 12 knots northward movement through South Texas.

- Gusty northerly winds normally continue for 18 to 24 hours following the passage of a sharp cold front at San Antonio, which ensures continued southward movement out of the South Texas area. Diminishing winds in less time usually indicate complications, such as wave formation or the front is becoming stationary along the warm coastal waters.

- The lowest ceiling expected with frontal or squall line passage may be forecast by subtracting 300 feet from the average lowest ceiling reported during frontal passage at San Antonio and Victoria.

SQUALL LINES

- The sea breeze has a strong influence on squall lines in advance of a rapid moving cold front. These squall lines reach maximum intensity between 1400 and 2000 local during the hours of the maximum sea breeze. Consequently, as squall lines near the coast, they are retarded. In spring and fall, they are intensified as they move near the coast.

- The most violent squall lines which pass through the local area form between San Antonio and Corpus Christi while the associated cold front is moving southward between Austin and San Antonio. Climatology records indicate movements up to 45 knots for the more severe squall lines, with violent thunderstorms accompanied by gusting winds of 55 knots. However, storms of this type are considered rare.

CLEARING

- Provided the front does not become stationary, clearing following frontal passage may be forecast as follows:

- Fronts moving less than 10 knots:

Add 12 hours to the time San Antonio becomes scattered

Add 3 hours to the time Victoria becomes scattered

- Fronts moving 10 to 20 knots:

Add 6 hours to the time San Antonio becomes scattered

Add 1 1/2 hours to the time Victoria becomes scattered

- Fronts moving in excess of 20 knots:

Scattered sky conditions occur 2 or 3 hours after the ceiling raises to 4000 feet provided upper winds show frontal surface at 4000 feet is less than 75 miles behind the surface front.

FRONTAL WAVE FORMATION

Occasionally, wave development on the Polar front south of the station is most common in winter and spring. This occurs if there is a trough aloft over New Mexico or West Texas.

After a wave develops, it usually moves northeast and occasionally eastward. Those that develop south and southwest of the station cause very low ceilings and visibilities due to continuous light rain, drizzle, and fog. These conditions are persistent and widespread to the north.

POST-FRONTAL WINDS

In early fall, warm sea surface temperatures tend to retreat to the east and northeast. Consequently, wind gradients to the north and northeast tighten resulting in increased velocities. This feature is especially noted in Galveston and Corpus Christi. Added components of 8 to 10 knots are frequent at Corpus Christi, while in the Galveston area 12 to 15 knots is not unusual.

F. SEVERE WEATHER

ICING

Aircraft icing conditions are infrequent, but are usually always severe when occurring. Whenever the freezing level is 5000 feet or less and overrunning is evident, forecast severe icing.

TURBULENCE

Moderate turbulence will occur below 5000 feet in clear dry Polar air which is heated over land during the day and over water during the night. The most frequent occurrence is during the late spring and early fall. Low-level turbulence is also induced by the strong southerly flow in the advance of approaching Polar fronts.

TORNADOES AND WATERSPOUTS

Tornadoes rarely occur south of a line from San Angelo through Austin to Galveston, although a few have been reported over the years in this region. North of this line, tornadoes appear often during the early spring and fall, usually in squall lines ahead of rapid moving cold fronts. Tornadoes other than these are usually associated with hurricanes and are not a common occurrence over South Texas.

Waterspout activity associated with small areas of unstable air and brief convective activity is frequent during late spring and early summer. These waterspouts are short in duration and develop when sea surface temperatures are 75 degrees F or greater in the surrounding area waters. They are normally reported along the Intercoastal Waterway near the Laguna Madre during early morning hours. However, they can appear in any of the numerous bodies of water located around Corpus Christi. While waterspouts rarely cause any damage, they do pose a potential hazard to aircraft and small craft operating in the area.

SQUALL LINES

Squall lines, associated with cP outbreaks in winter and spring, normally form ahead of fast moving cold fronts. This line is usually located in the warm sector of a developing wave 100 to 250 miles ahead of a cold front.

Showers and thunderstorms (and sometimes tornadoes) occur along the squall line, and the wind shifts cyclonically with passage. There is generally a large drop in temperature. Pressure rises after the passage of the squall line, and at times a small micro-high may form behind it. When this occurs, the cold front will have little weather or clouds associated with it.

Squall lines are not necessarily confined to the warm sectors of wave cyclones. There are noted cases where squall lines have been identified behind the cold front which it overtakes and passes as it moves out in the warm sector.

During the summer and fall months with an active hurricane season, squalls associated with the leading edge of a tropical storm can be just as severe as frontal related ones. Favorable conditions for development are:

- Cold air advection in the middle and higher levels.
- Minimum stability indices are usually 0 or less in the areas of development.
- Maximum analyzed dewpoint areas at the 850 and 700 millibar levels are hints of favorable conditions in these areas.
- A favored position for squall line formation is on the west and central portion of moist and warm tongues.

- Low-level convergence and lifting.
- Warm air advection at the 850 millibar level.
- In the cyclonic shear of the jet at the 850 millibar level.

G. OUTFLOW BOUNDARIES OF MESOSCALE CONVECTIVE SYSTEMS

In late spring and early summer, large Mesoscale Convective Systems (MCS) commonly form over the Hill Country of the Red River Valley near San Antonio. These thunderstorm systems produce strong downdrafts during the dissipation stage that result in a distinctive outflow boundary. These outflow boundaries expand rapidly out from these mesoscale systems and produce intense (line type) thunderstorms. These thunderstorms often appear as a discontinuous line or ring of convective activity on radar and advance surprisingly at a high rate of speed (up to 45 knots). Outflow boundary thunderstorms often dissipate when they reach San Antonio. However, the Corpus Christi area experiences an average of four to eight outflow passages each year that produce very intense thunderstorms. Severe thunderstorms (tops in excess of 40,000 feet) and marked windshifts will accompany each outflow passage. Wind flow associated with each passage frequently gusts to 35 knots or more. However, these gusts are short in duration (less than one hour). The primary forecasting tool to determine the intensity and duration of the outflow boundary is the WSR-88D NEXRAD radar system. The forecaster must be cognizant of the mechanics associated with outflow boundary thunderstorms and be aware of the rapid speed of movement.

H. GULF OF MEXICO/CORPUS CHRISTI BAY INFLUENCES

Without question, the main influence on local weather is the Gulf of Mexico and Corpus Christi Bay. The close proximity of these bodies of water produces a pronounced effect on nearly every type of weather situation that NAS Corpus Christi experiences.

LAND AND SEA BREEZES

The annual temperature range of the Gulf and Bay waters is normally 52 to 85 degrees F. In summer, inland temperatures can reach 96 to 100 degrees F and cause differential heating between the land and sea. This produces an onshore wind component of 12 knots or more. The sea breeze usually begins around 1000 local and ends about 2100 local. There is little land and sea temperature differential during the late evening and early morning hours, due to land and sea temperatures staying within 3 degrees F of each other. In early spring and fall, sea and land breezes are dependent upon the surrounding air temperature. A strong offshore northwest wind component is often observed in early fall, during both day and night, after passage of a strong cold front. In early spring, maximum temperatures often climb to the high 80's resulting in an onshore wind component of 8 to 12 knots maintained throughout the night hours. Expect rapid

cooling along the coast after dark.

I. EASTERLY WAVES AND TROPICAL CYCLONES

EASTERLY WAVES

Weather from these disturbances often affects the South Texas Coastal Bend area from June through November. However, easterly waves normally have a maximum effect on the coastal bend area in August and September. Most easterly waves will be ill-defined and occasionally become stationary just east of the area. When this happens, these systems can cause heavy rainshowers and thunderstorms for two to four days in the local area. Most easterly waves average five degrees longitude of movement per 24 hours. Usually, deceleration indicates development while acceleration indicates weakening. Heavy rainshowers and probable flooding conditions occur when a trough over central Texas merges with an active easterly wave from the Gulf of Mexico. This particular situation is most likely to occur in September. During the summer after 1200 local, when water temperatures are high, easterly waves approaching the coast are weak and ill-defined over water. These systems generate numerous thunderstorms immediately inland which usually dissipate after sundown. Easterly waves nearing the coastline during the night or before noon of one day and pass inland are usually followed by a second area of instability the next day. The convective activity produced on the second day will pass inland during the morning hours and cause extensive showers and thunderstorms over the station.

TROPICAL CYCLONES

An average of two to four tropical cyclones develop into hurricanes annually in the Gulf of Mexico. In addition, two or more may enter the Gulf around Cuba. Tropical cyclones that develop near Cuba are often stronger in intensity since they become larger and more mature as they enter the Gulf. These tropical cyclones receive little resistance to movement and therefore intensify. If these tropical cyclones strike the coastal area, they will produce severe wind and weather conditions. Tropical cyclones that originate in the Gulf of Mexico usually do not reach the mature stage until close to a coastline. These systems develop rapidly and have very erratic movements; however, they can be readily detected by satellite. IFR conditions occur rapidly following the detection of weather associated with these systems within 300 miles of land and may be particularly unfavorable for aircraft evacuation if the storm center is southeast of NAS Corpus Christi.

Weather experienced during the approach of a tropical cyclone depends upon many predictable factors. Primarily, the orientation of the axis of an easterly wave in relation to the location of the tropical cyclone must be known. An estimate may be made from ship reports as well as any Gulf Coast stations. Streamline analysis of lower level winds can aid in determining the presence of an easterly wave or inverted trough. It has been observed that tropical cyclones spawned in the Gulf of Mexico along the axis of strong easterly waves usually retain the weather characteristics of the wave and pass inland without reaching hurricane strength. The axis of the easterly wave, which may become associated with the spiral band of a mature tropical cyclone, will bring the

worst weather conditions. This weather will consist of broken to overcast low and middle clouds with squalls and thunderstorms. Local reconnaissance flights and radar have supplied early warning as distant as 150 miles. Storms which pass to the south of the station enter the Mexican coast before the easterly wave axis reaches the station. Tropical storms that form or pass to the east do not create severe weather locally unless passing closer than 100 miles. Generally, a low pressure trough will develop near the local area joining the storm and the "Mexican Low" to the west. IFR conditions in a band of about 30 miles width and isolated thunderstorms appear along this trough as the tropical storm moves northward.

It is of utmost importance that tide tables be considered when tropical storms are expected to pass close to the local coastal area. Generally, a storm approaching from the southeast poses the most serious threat, but those located to the east may also be severe. Sustained surface winds from the east to southeast of 45 knots will produce a four to six foot rise in normal tides. This is sufficient to isolate personnel on Matagorda Island as well as portions of North Beach. A 60 knot wind produces an abnormal tide of eight to ten feet with surf crossing parts of Padre Island. The hurricane of 1919, with center winds of 100 knots, produced a tidal height of eleven to sixteen feet. Such a rise would be sufficient to cover portions of the station.

J. THE LEE TROUGH

The lee side trough that develops east of the Rocky Mountains is well known. The length of this trough is determined by the strength of the zonal westerly flow above 7000 feet across the

Rockies, from Idaho to Mexico. Whenever the flow over the Pacific Coast exceeds 25 knots, a trough can be expected for form in any region of the Rockies. When the belt of strong westerly or southwesterly flow extends southward to southern California, a trough appears along the Rio Grande Valley. Little or no weather appears in this trough from the Texas Panhandle southward since the air is extremely dry.

These troughs will influence the local weather when sufficient moisture is present in the air mass opposing their advance into the Gulf. As strong cold fronts and upper fronts move across the Rockies, and the zonal flow over the mountains turns west-northwest or northwest behind the frontal zone, the trough commences to move out of the lee and ahead of the front. The trough becomes a squall line with an area of north to northwest winds at the surface between the cold front and the squall line. This produces downslope winds along the front and greatly weakens it. This is the reason that the pre-frontal squall line has much more severe weather than the front itself when passing through the local area.

In southwest Texas, the front remains dry and no apparent squall line forms. In this region, the trough merely turns the surface winds to the west and southwest ahead of the cold front and produces little or no weather.

Trough passages also cut off or reduce the south to southeast flow ahead of a cold front. At the Gulf Coast, surface winds become light and variable three to five hours prior to frontal passage.

K. THE MEXICAN LOW

The thermal low over northwestern Mexico becomes most pronounced during summer and early fall coinciding with the period of maximum surface heating. The low pressure center remains stationary during most of this period with a trough extending northwestward into southern California. Normally, this low does not influence the weather locally. However, when the extension of the Bermuda High builds westward over the Gulf of Mexico in the summer months, the gradient across the coastal bend strengthens and moderate to strong south to southeast flow results.

On rare occasions, the Mexican Low will move eastward. No satisfactory explanation has been found for this, but the movement further intensifies the pressure gradient in the western Gulf. These gradient winds will reach near gale conditions during the afternoon, coinciding with peak heating and sea breeze times with wind speeds of 30 knots gusting to 35 knots or higher along the Coastal Bend. These winds gradually diminish to less than 15 knots after 2100 local. The morning winds aloft observation may be used reliable for early indication of strong afternoon surface winds. When 30 knot winds are observed in the first 2000 feet, the afternoon surface winds will reach 25 to 30 knots.

SECTION IV

SPECIALIZED FORECASTS AND SUPPORT

A. FORECASTS

OPTIMUM AIRCRAFT ROUTING SYSTEM (OPARS)

OPARS is a Navy computer flight plan system that selects optimum routes for military aircraft. Unclassified flight plans are processed via telephone lines through Fleet Numerical Meteorology and Oceanography Center, Monterey, California.

Pilots should submit requests for OPARS at least six hours prior to flight weather brief time to assure data provided is the most current for their proposed departure time.

DAILY WEATHER FORECAST (DWF)

The DWF is a plain language 36 hour local forecast provided to NAS Corpus Christi and tenant commands, Monday through Friday (except holidays). The forecast includes climatological statistics, astronomical data, current surface weather analysis, and five-day outlook.

INGLESIDE HARBOR AND COASTAL FORECAST

The Ingleside Harbor and Coastal Forecast is a 24 hour forecast provided to Naval Station (NAVSTA) Ingleside and all naval units present at NAVSTA Ingleside. This forecast includes weather and sea conditions for Corpus Christi Bay, Aransas Pass ship channel, and coastal waters out to 3 NM from 26.0N to 28.5N along the Texas Gulf coast.

B. SUPPORT

LOCAL DOD/DOC COMMANDS SUPPORTED

- CNATRA
- TRAWINGFOUR

VT-27, VT-28, AND VT-31

- COMINEWARCOM
- HM-15
- MIWTRACEN

- NAS CORPUS CHRISTI
- CORPUS CHRISTI ARMY DEPOT
- COAST GUARD AIR STATION
- U.S. CUSTOMS SERVICE

SUPPORT PROVIDED

- RECOMMENDATIONS FOR TROPICAL CYCLONE CONDITION OF READINESS (COR)
- STAFF/COMMAND BRIEFINGS
- FLIGHT WEATHER BRIEFINGS/OPARS
- TERMINAL AERODROME FORECASTS
- MET FORECASTS
- HAZARDOUS WEATHER WARNINGS/ADVISORIES
- CLIMATOLOGY SUMMARIES
- CLASSROOM ENVIRONMENTAL TRAINING

SUB-REGIONAL FORECAST CENTER (SRFC) SUPPORT

- NAVTRAMETOC DET KINGSVILLE
- NAVTRAMETOC DET FORT WORTH

SUPPORT PROVIDED

- FLIGHT WEATHER BRIEFINGS
- TERMINAL AERODROME FORECASTS
- HAZARDOUS WEATHER WARNINGS

FLEET AND AVIATION LIAISON PROGRAM

- AFLOAT UNITS NAVSTA INGLESIDE
- TRANSIENT UNITS

SUPPORT PROVIDED

- INGLESIDE HARBOR AND COASTAL FORECAST
- HAZARDOUS WEATHER WARNINGS/ADVISORIES
- QM/ST OBSERVATION TRAINING
- ENVIRONMENTAL PACKETS
- PRE-SAIL/NAVIGATION BRIEFINGS
- FLEET LIAISON VISITS
- AVIATION GROUND SCHOOL

C. CROSSWIND AND ICING PARAMETERS

AIRCRAFT	MAXIMUM CROSSWIND	ICING CAPABILITIES	OTHER PARAMETERS
T-34C	30 KTS 22 KTS- FLAPS IN 15 KTS-FULL FLAPS 10 KTS - SOLO'S	NONE	NO MODERATE TURBULENCE
T-44A	20 KTS	FULL	
TC-12B	25 KTS	FULL	

D. WARNING/ADVISORY MATRIX

NAVAL AIR STATIONS CORPUS CHRISTI (NGP), KINGSVILLE (NQI) AND FORT WORTH (NFW)

WARNING/COR	ACTIVITY	TIME FRAME	WIND SPEED	REMARK
THUNDERSTORM CONDITION II	NGP/NQI/ NFW	Possible w/i 6 hrs.	< 50 kts < ¾ in hail	Tstms poss 25 nm of a
THUNDERSTORM CONDITION I	NGP/NQI/ NFW	Imminent or w/i 1 hr.	< 50 kts < ¾ in hail	Tstms poss 10 nm of a
TORNADO/SEVERE THUNDERSTORM CONDITION II	NGP/NQI/ NFW	Possible w/i 6 hrs.	≥ 50 kts ≥ ¾ in hail	Tornadic a possible w 25 nm of a
TORNADO/SEVERE THUNDERSTORM CONDITION I	NGP/NQI/ NFW	Imminent or w/i 1 hr.	≥ 50 kts ≥ ¾ in hail	Tornadic a &/or sever 10 nm of a
WATERSPOUT ADVISORY	NGP	As soon as fcst.	N/A	Waterspou cloud spot

SMALLCRAFT WARNING	NGP	As specified by FDO.	18-33 kts	Issued for inlets or co
GALE CONDITION II	NGP/NQI/ NFW	Within 24 hrs.	34-47 kts	Extra-trop force wind
GALE CONDITION I	NGP/NQI/ NFW	Within 12 hrs.	34-47 kts	Extra-trop force wind
STORM CONDITION II	NGP/NQI/ NFW	Within 24 hrs.	≥ 48 kts	Extra-trop force wind
STORM CONDITION I	NGP/NQI/ NFW	Within 12 hrs.	≥ 48 kts	Extra-trop force wind
MARGINAL WEATHER ADVISORY	NQI	2 hr lead time/ 2 hr prior to field opening to closure	N/A	Cig ≤ 150 Vis ≤ 5 mi DP Depres and FG fcs

Table IV-1: Warnings/Advisories/Conditions of Readiness Matrix

NAVAL AIR STATIONS CORPUS CHRISTI (NGP), KINGSVILLE (NQI) AND FORT WORTH (NFW)

WARNING/COR	ACTIVITY	TIME FRAME	WIND SPEED	REMARK
HIGH WIND ADVISORY	NGP/NQI	As specified by FDO.	NGP - Fqt Gusts ≥ 30 kts NQI - Gusts or sustained > 25 kts	NGP and N
HIGH WIND ADVISORY CONDITION II	NFW	Within 24 hrs.	18-33 kts Fqt Gusts ≥ 24 kts	NFW and
HIGH WIND ADVISORY CONDITION I	NFW	Within 12 hrs.	18-33 kts Fqt Gusts ≥ 24 kts	NFW and
FREEZE WARNING	NGP/NQI	As specified by FDO.	N/A	Temp < 32
FREEZE WARNING CONDITION II	NFW	Fcst for > 12 hrs.	N/A	Temp < 32
FREEZE WARNING CONDITION I	NFW	Fcst for < 12 hrs.	N/A	Temp < 32
Winter Storm Watch	NFW	Within 24 hrs.	N/A	Heavy SN &/or IP fcs
Winter Storm Warning	NFW	Within 6 hrs.	N/A	Heavy SN &/or IP fcs
CAWW	NGP/NQI	As specified by FDO	N/A	Embedded Thunderst Issued IAW CNATRA

Table IV-2: Warnings/Advisories/Conditions of Readiness Matrix (continued)

WARNING MATRIX
NAVAL STATION INGLESIDE

WARNING/COR	TIME FRAME	WIND SPEED	REMARKS
THUNDERSTORM WARNING	At least 3-5 hrs lead time, but not more than 12 hrs.	< 50 kts < ¾ in hail	Tstms possible w/i 5 nm of NAVSTA Ingleside.
SEVERE THUNDERSTORM WARNING	At least 3-5 hrs lead time, but not more than 12 hrs.	≥ 50 kts ≥ ¾ in hail	Severe Tstms possible w/i 5 nm of NAVSTA Ingleside.
TORNADO WARNING	At least 3-5 hrs lead time, but not more than 12 hrs.	≥ 50 kts ≥ ¾ in hail	Tornadic activity & severe Tstms possible w/i 5 nm of NAVSTA Ingleside.
SMALLCRAFT WARNING	At least 3-5 hrs lead time, but not more than 12 hrs.	18-33 kts.	Issued for harbors, inlets or coastal inshore areas.
GALE WARNING	At least 3-5 hrs lead time, but not more than 12 hrs.	34-47 kts.	Extra-tropical gale force winds.
STORM WARNING	At least 3-5 hrs lead time, but not more than 12 hrs.	≥ 48 kts.	Extra-tropical storm force winds.
FREEZE WARNING	At least 3-5 hrs lead time, but not more than 12 hrs.	N/A	Temp < 32 F.

Table IV-3: NAVSTA Ingleside Warning Matrix

SECTION V

ENVIRONMENTAL EFFECTS

A. TROPICAL CYCLONES

Tropical cyclones normally occur from 1 June to 30 November each year. An estimated 30 tropical cyclones of tropical storm intensity or greater have passed within 75 miles of NAS Corpus Christi in the past 100 years. This averages to about one tropical cyclone every 3.6 years. Thirteen hurricanes have passed within 50 miles of NAS.

HISTORY

History has shown that tropical cyclones either move up from the south or southeast out of the Gulf of Mexico toward the north or northwest and make landfall or parallel the Texas coast. Tropical cyclones moving northwest or north are more likely to affect the Corpus Christi area than the westward moving ones. Also, dates of past hurricanes have shown that there is no time of year for a particular direction to occur. Hurricane season is from 1 June to 30 November with the median of maximum occurrence in August and September.

Of the three most destructive tropical cyclones to pass within 75 miles of Corpus Christi, Beulah (1967), Celia (1970) and Allen (1980), have each inflicted distinctly different types of damage. Beulah's damage was mostly from freshwater flooding following extremely heavy aftermath of rainfall (27 to 30 inches). Beulah made landfall near Brownsville packing sustained winds over 100 knots and spawned a record 115 tornadoes, some as far inland as Austin.

Celia made landfall midway between Corpus Christi and Aransas Pass inflicting tremendous wind damage. While sustained winds were not much different from Beulah's, Celia packed very strong gusts (estimated as high as 155 knots near Aransas Pass) that inflicted trails of destruction across Corpus Christi.

Allen was one of five storms classified as a category five hurricane to ever occur in the Gulf of Mexico (winds greater than 135 knots on the Saffir/Simpson disaster scale). Fortunately, it weakened just prior to reaching the coast over the sparsely populated area between Corpus Christi and Brownsville. Most of the 600 million dollars worth of damage was caused by storm surge and strong winds.

Among the storm's worst killers and destroyers of property, tornadoes always pose a threat in the hurricane area. The greatest outbreak of tornadoes on record was associated with Hurricane Beulah when 115 tornadoes were spawned during a five-day period. Sixty-seven of these occurred on one day, setting a national record.

AVERAGE STRENGTH

Tropical cyclones that have affected Texas have had an average strength as listed below:

- Maximum winds - 87 knots
- Minimum pressure - 962 millibars
- Maximum tide - 10 feet

B. CONDITIONS OF READINESS

Conditions of Readiness (COR) for the Corpus Christi area are set by CNATRA based upon recommendations from the Detachment OIC. The following are the COR's:

Condition V	Seasonal (1 June through 30 November)
Condition IV	Destructive force winds possible within 72 hours
Condition III	Destructive force winds possible within 48 hours
Condition II	Destructive force winds possible within 24 hours
Condition I	Destructive force winds possible within 12 hours

Destructive force winds are defined as wind gusts of 50 knots or greater at NAS Corpus Christi or 35 knots or greater at NAVSTA Ingleside.

C. STORM SURGE

In most hurricanes, the storm surge causes the most loss of life and property damage. Storm surge is different from regular tides. Storm surge is an abnormal rise of the sea level along a shore primarily as a result of the winds of a hurricane. The level of the storm surge is usually well above the high tide level. The storm surge is particularly damaging when it coincides with the normal high tide.

Storm surge development takes place over deep water, where the drop in barometric pressure in the storm center causes the sea to bulge. A second action develops as hurricane winds sweep across the sea surface. This causes a swirling movement of the surface water which gradually goes down to about 50 fathoms (300 feet).

The maximum swirl moves to the right of the hurricane's eye (track), where wind speeds are

highest. There is no change in sea level due to this swirling motion as long as the water remains deeper than 50 fathoms.

As the hurricane approaches land, the swirling water mass scrapes the bottom, tries to spread in all directions, and begins to pile up. Peak surge heights are seen at the shoreline about the time the hurricane center reaches land.

The maximum water swirl occurs 10 to 20 miles to the right of the storm track, near the point of maximum wind speeds. Thus, the greatest danger from both winds and surge is usually about 15 miles right of the track.

The surge may lift the ocean 15 feet or more at the coastline. Carla (1961) produced a 21 foot surge at Matagorda Bay. Camille, which hit Mississippi in 1969, caused a 25 foot surge, the highest ever recorded in the Western Hemisphere.

Where barrier islands exist, the storm surge usually cuts channels completely through the islands. For example, Beulah cut through Padre Island in 31 places.

SAFFIR/SIMPSON DISASTER POTENTIAL SCALE

Category	Sustained winds	Storm Surge
I	64 to 82 knots	4 to 5 feet
II	83 to 95 knots	6 to 8 feet
III	96 to 113 knots	9 to 12 feet
IV	114 to 135 knots	13 to 18 feet
V	135+ knots	18+ feet

NAS SEA WALL: 9.3 FEET ABOVE MEAN SEA LEVEL
HANGAR DECKS: 12 FEET NEAR SEA WALL
16 FEET NEAR RUNWAY